Oct. 31, 1950 R. W. SUMAN 2,527,594

UNDERFEED STOKER, INCLUDING A ROTATABLE BURNER HEAD

Filed Dec. 13, 1945 5 Sheets-Sheet 1

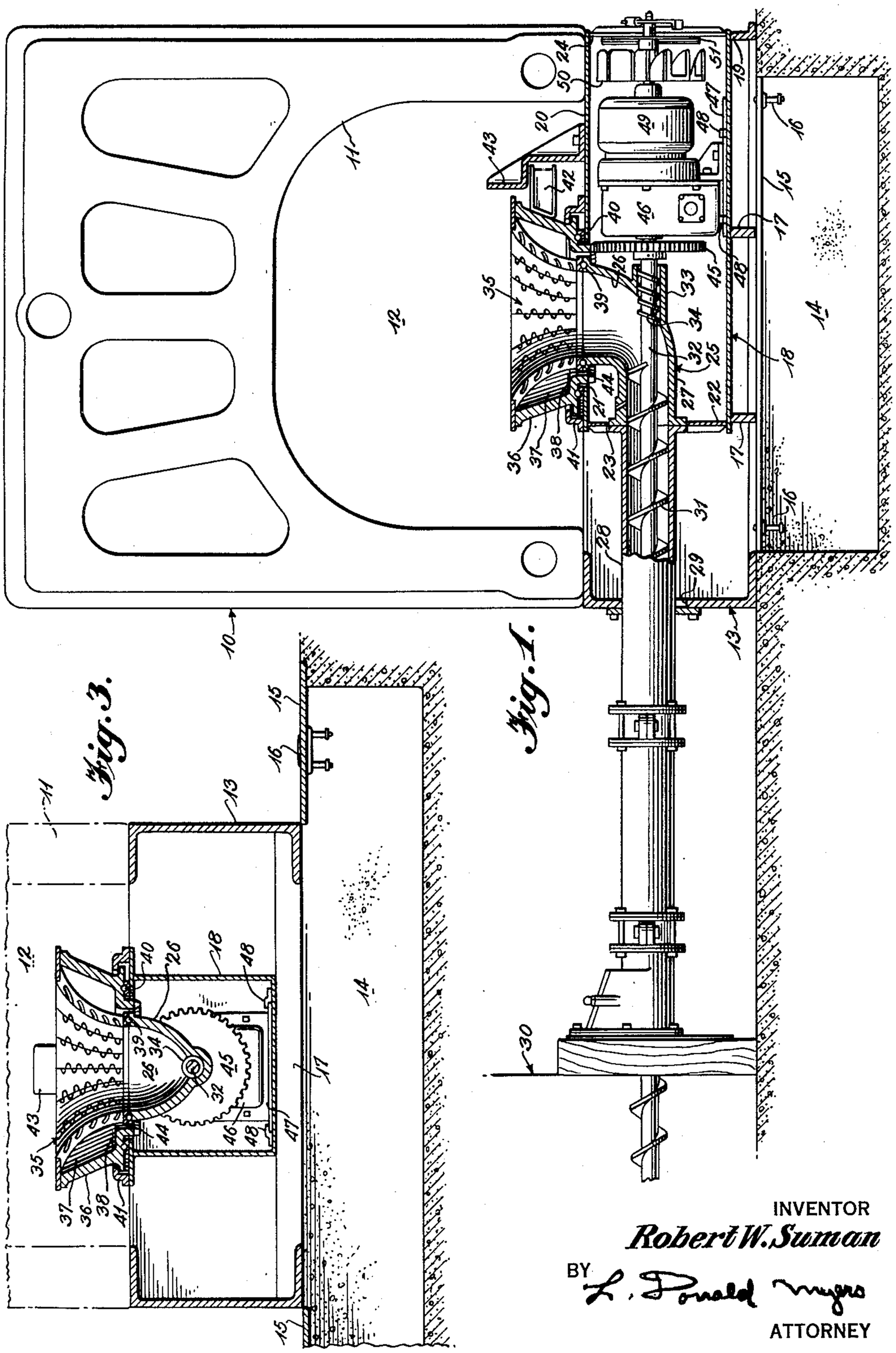

Fig. 1.

Fig. 3.

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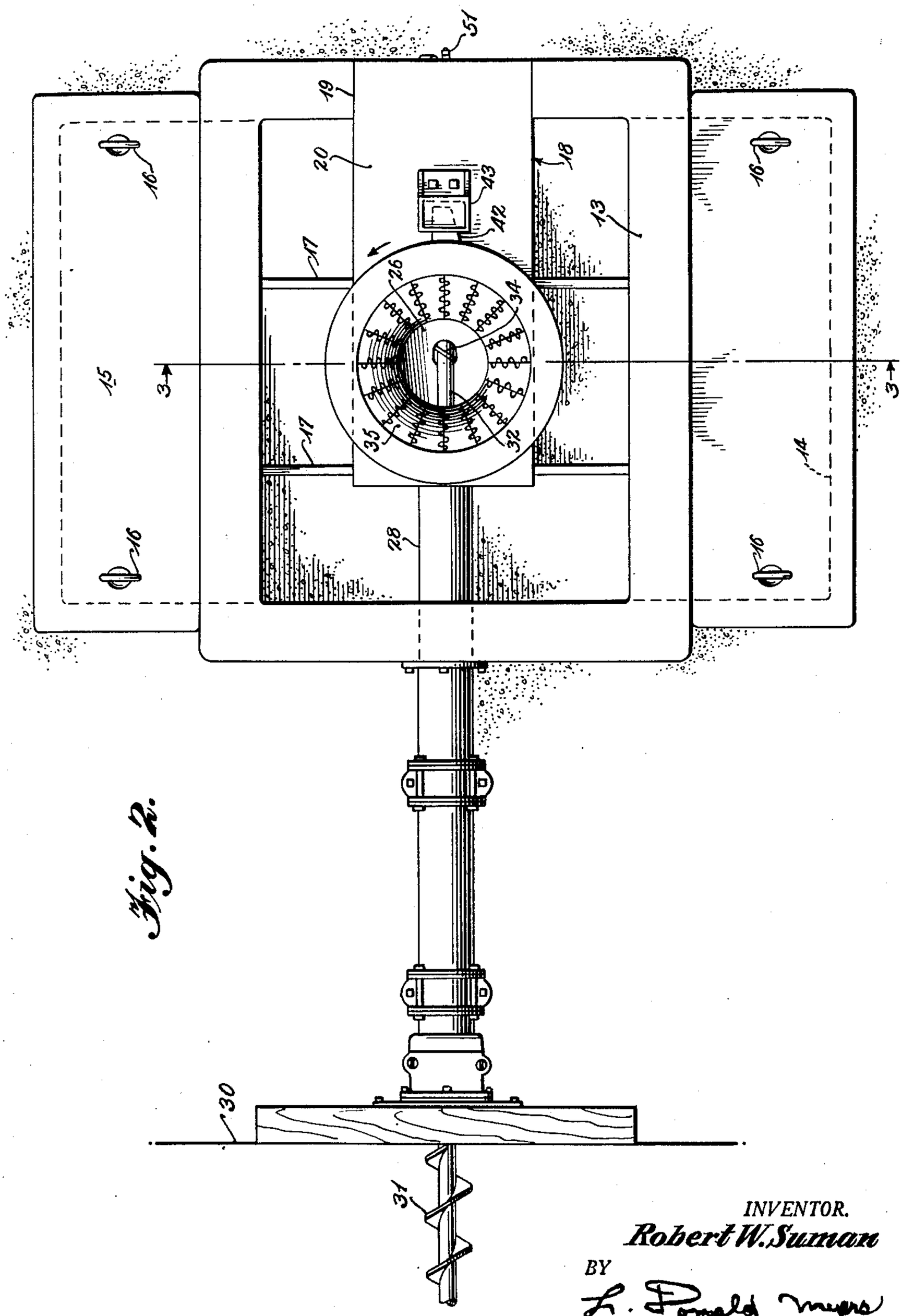

Fig. 2.

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UNDERFEED STOKER, INCLUDING A ROTATABLE BURNER HEAD

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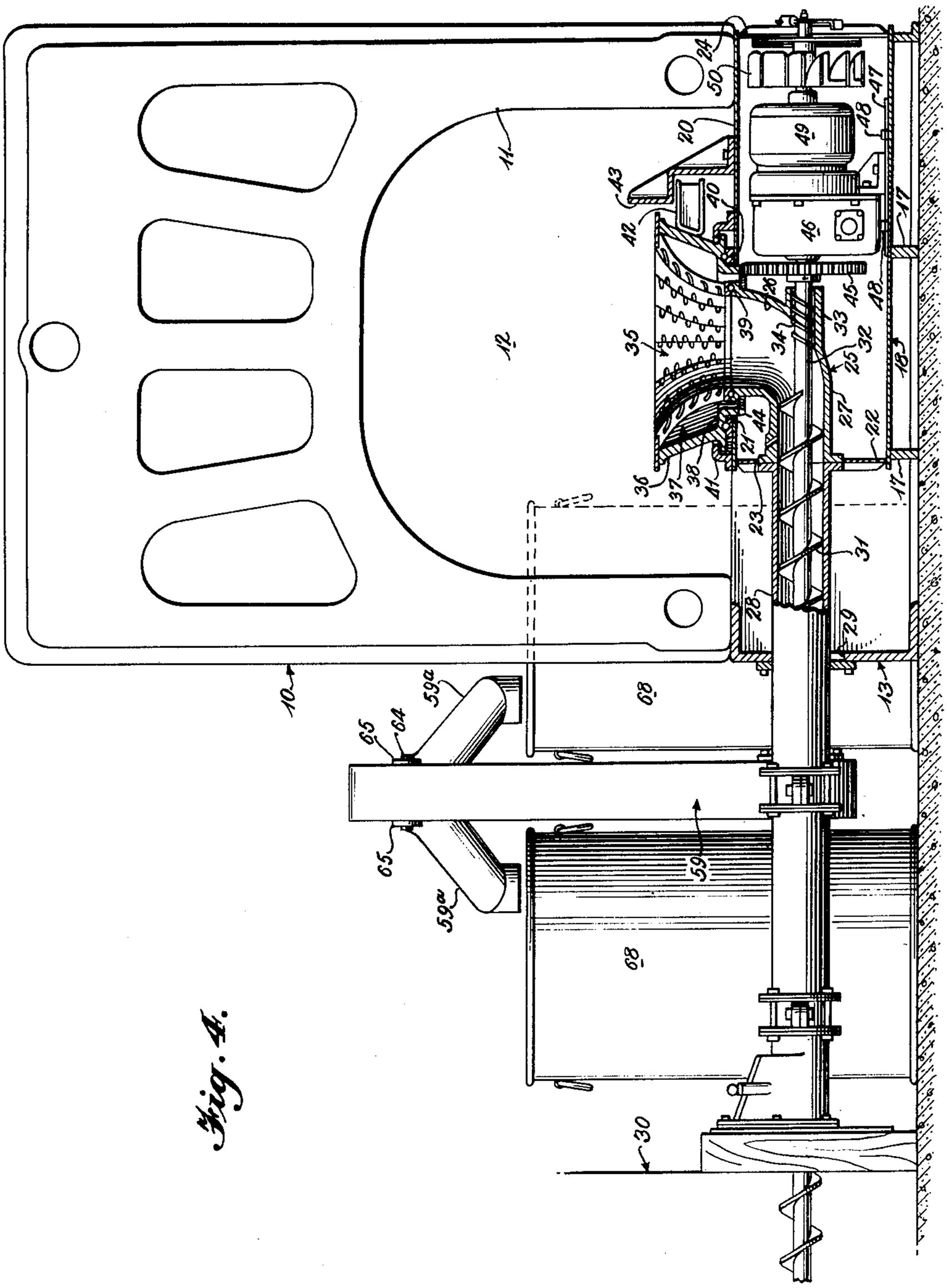

Fig. 4.

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UNDERFEED STOKER, INCLUDING A ROTATABLE BURNER HEAD

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Fig. 5.

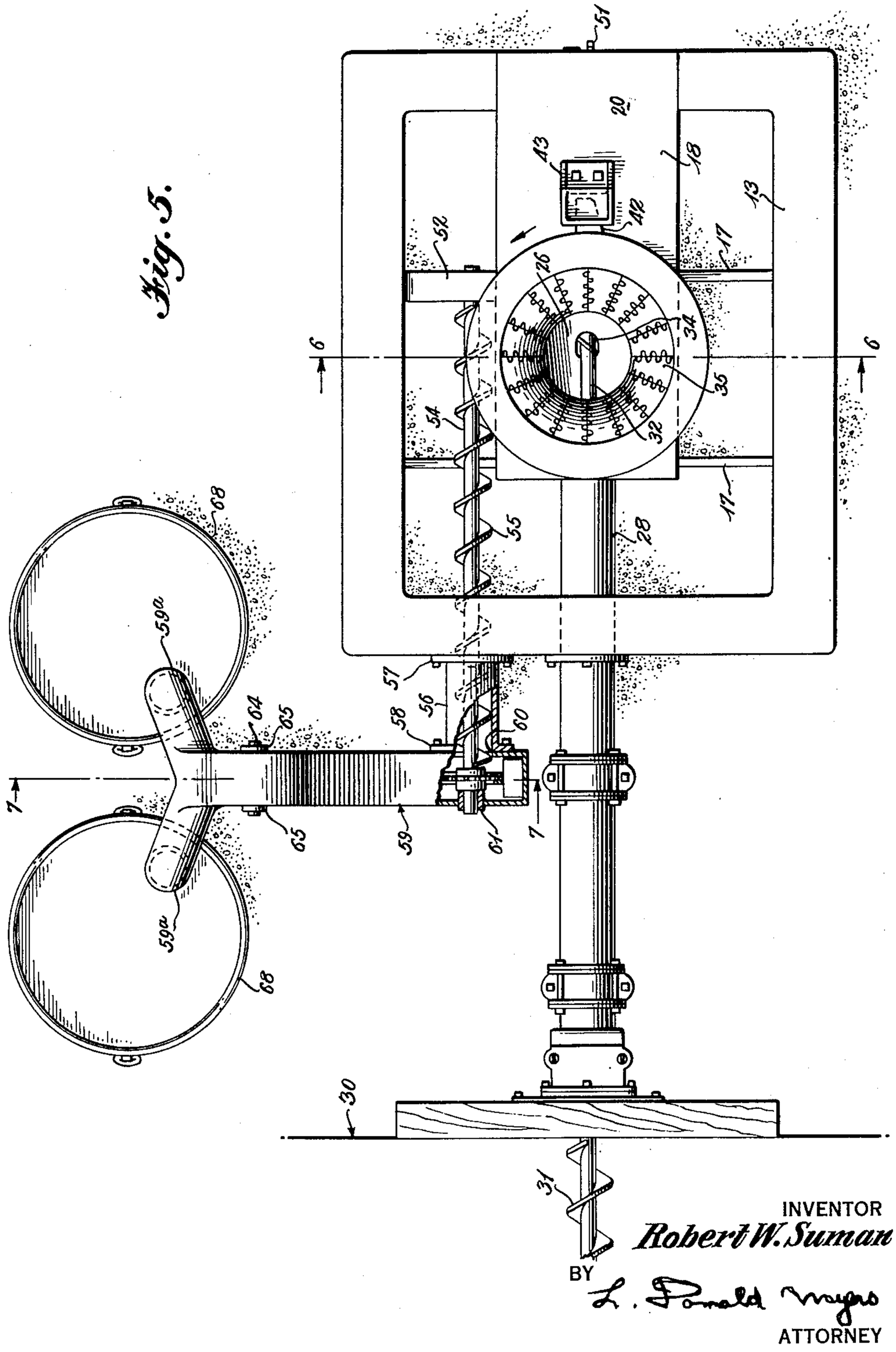

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Fig. 6.

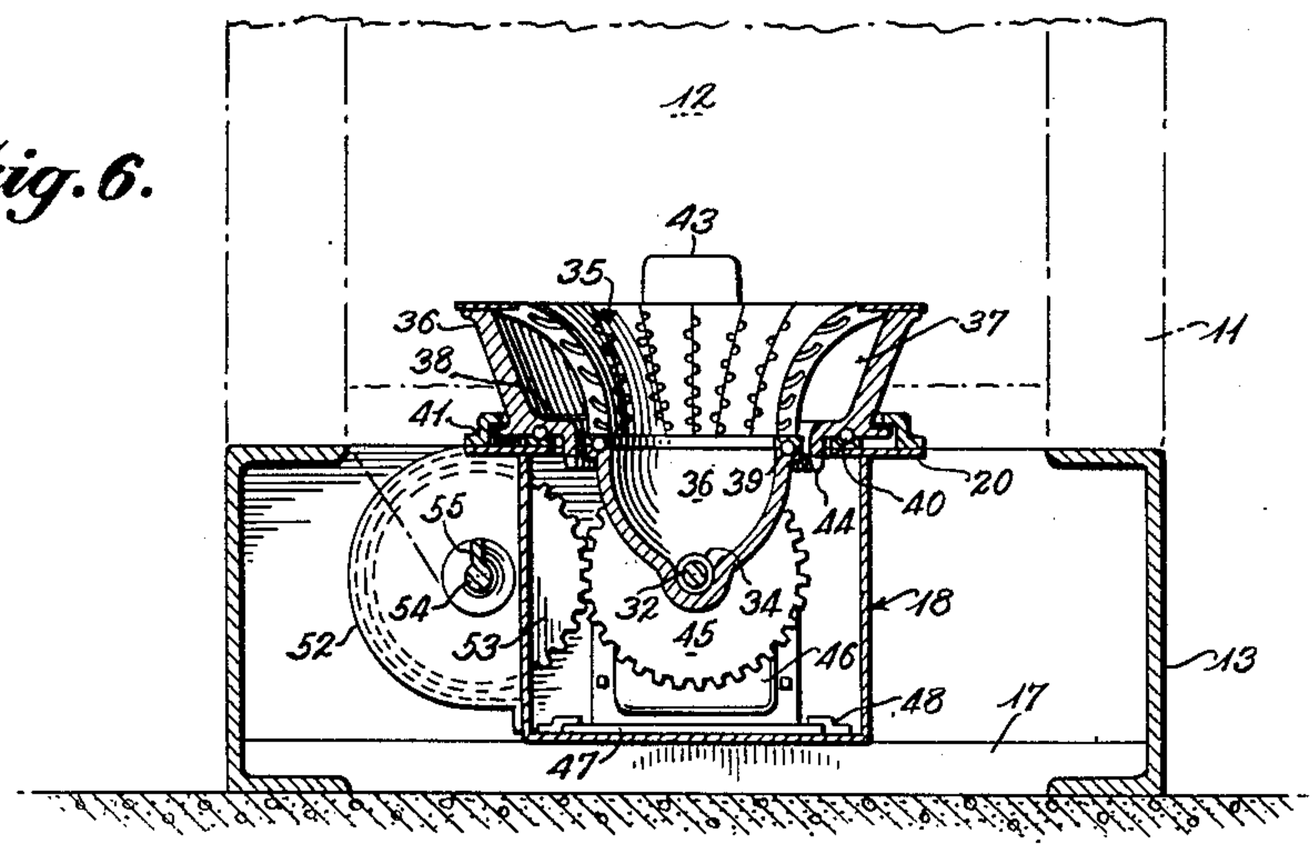
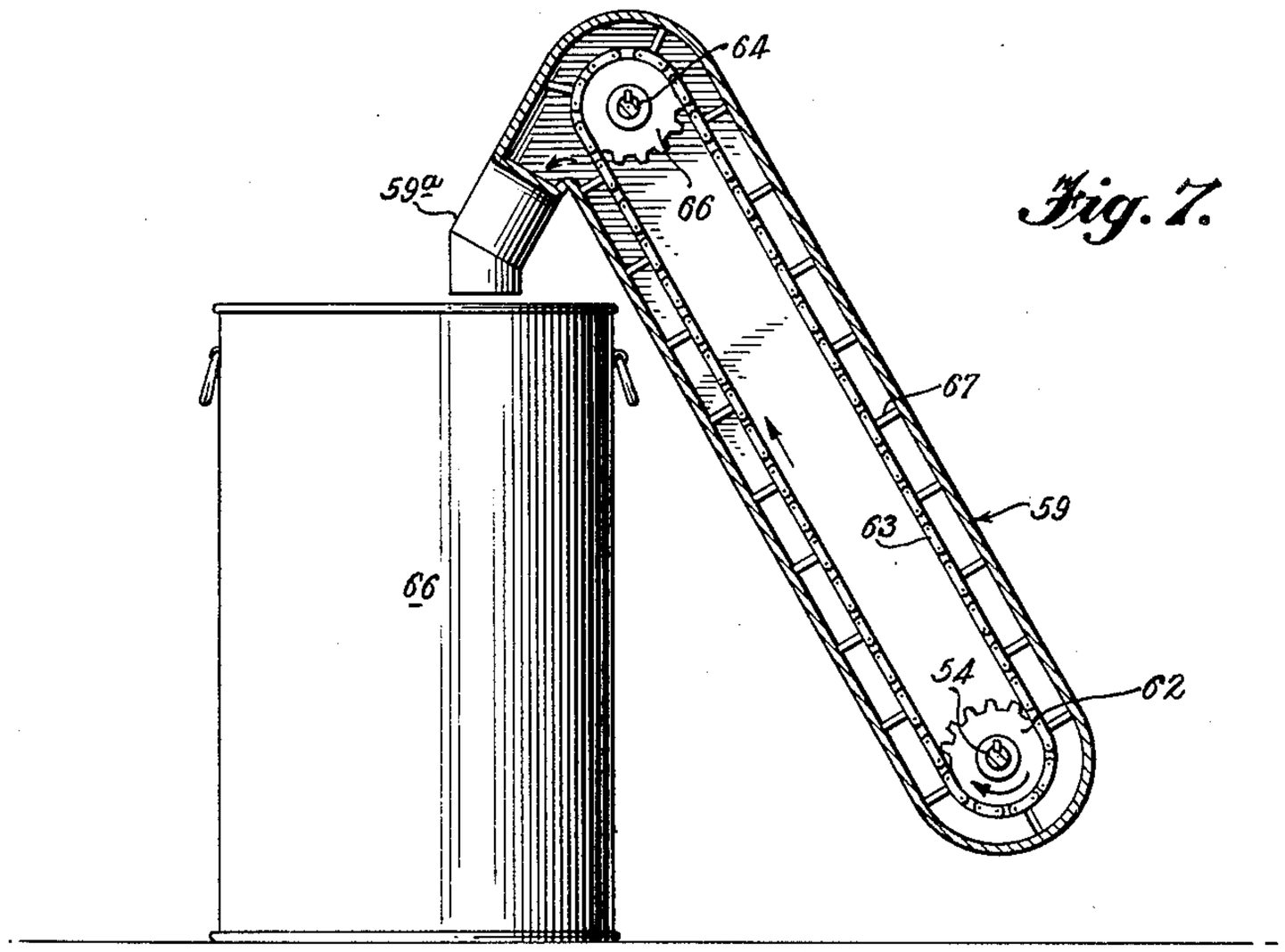


Fig. 7.



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Patented Oct. 31, 1950 2,527,594

UNITED STATES PATENT OFFICE

2,527,594

UNDERFEED STOKER, INCLUDING A ROTATABLE BURNER HEAD

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Application December 13, 1945, Serial No. 634,654

2 Claims. (Cl. 110—45)

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This invention relates to new and useful improvements in stokers for use with heating furnaces or boilers, and deals more particularly with the application to the anthracite coal stoker field of the new principle disclosed and broadly claimed in my Patent No. 2,387,781, issued October 30, 1945.

The new stoker principle of the above identified patent briefly may be described as involving installing within the base portion or ash pit of a heating boiler or furnace all of the elements constituting a stoker assembly with the exception of the fuel supply bin or hopper and a portion of the fuel feeding conveyor. When this principle is applied to anthracite stokers, it becomes possible to drive fuel feeding conveyors, rotatable burner heads, ash collectors, ash removers, and/or other suitable accessories from the stoker prime mover which is located in the base of the heating boiler or furnace.

It is the primary object of this invention to provide an anthracite stoker assembly which, with the exception of the fuel supply bin or hopper and portions of the fuel feeding and ash removing conveyors, can be installed within the base or lower portion of heating boilers or furnaces.

Another primary object of the invention is the provision of a stoker assembly of the above mentioned type which is provided with a combined rotary burner head and ash collector that is actuated by the normal prime mover of the stoker, which is located in the base portion of the heating boiler or furnace.

Still another important object of the invention is the provision of an anthracite stoker assembly which has mechanism driven by the prime mover of the assembly, located in the base of the boiler or furnace, that will function to remove from said base portion the ash that is discharged by the stoker burner head.

Another object of the invention is to provide an anthracite stoker assembly for heating boilers or furnaces in which a fuel feeding conveyor, a rotatable burner head, ash collector and removal mechanism, and combustion air supplying means are driven by a common motor and its speed reducer unit which are located in the base or ash pit of the boiler or furnace.

Still another object of the invention is the provision of an anthracite stoker assembly in which a housing, positioned in the base of a heating boiler or furnace, is employed to perform the functions of supporting a rotatable burner head and of enclosing certain mechanism of the assembly to protect said mechanism from damage by the ash that discharges from the burner head.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings forming a part

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of this specification and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a front elevational view of a boiler type of heating plant, with the front wall of the boiler casing removed, and with the base portion shown in vertical section, in which is installed an anthracite stoker assembly embodying this invention,

Figure 2 is a top plan view of the base or ash pit portion of the heating unit illustrated in Fig. 1 with the anthracite stoker assembly installed therein,

Figure 3 is a vertical sectional view taken on line 3—3 of Fig. 2,

Figure 4 is a similar view to Fig. 1 but illustrates a modified form of anthracite stoker assembly installed therein which includes suitable ash removal mechanism,

Figure 5 is a top plan view of the base or ash pit portion of the heating plant disclosed in Fig. 4 with the anthracite stoker assembly of this latter figure properly installed therein,

Figure 6 is a vertical sectional view taken on line 6—6 of Fig. 5, and

Figure 7 is a detail vertical sectional view of a portion of the ash removal mechanism and taken on line 7—7 of Fig. 5.

In the drawings, wherein for the purpose of illustration are shown the preferred embodiments of this invention, and first particularly referring to Figs. 1 to 3 inclusive, the reference character 10 designates in its entirety a boiler type of heating plant.

It is to be understood, however, that a furnace, of other types of heating plants, could just as well have been employed to illustrate this invention.

The heating plant 10 includes the steam generating upper section 11 that is shaped to provide a combustion chamber 12. This steam generating portion 11 is mounted on and supported by the base portion 13 which may take the form of the conventional ash pit of the heating plant or a special base may be substituted. It will be noted by inspecting the figures that the interior of the base portion 13 and the combustion chamber 12 are in open communication with each other. That is to say, no partition or dividing wall is interposed between the steam generating boiler sections 11 and the ash pit or base portion 13. Consequently, the ash that is discharged from the burner head of the stoker assembly will be allowed to drop into the base portion 13.

In the embodiment of the invention illustrated in Figs. 1 to 3 inclusive, the bottom of the base portion 13 is left open so that the ash discharged into this base portion will pass through the latter and be deposited in the ash pit 14 that is formed beneath the heating plant. This ash pit 14 may be of any desired size. That is to say, it may

have a capacity that will accommodate the ash for two or three weeks of operation of the stoker assembly or it may be capable of receiving all of the ash produced during a complete heating season. To whatever extent the ash pit 14 extends beyond the sides of the heating plant 10, suitable cover plates 15 may be employed for closing such ash pit extensions. These cover plates should be removable to facilitate withdrawal of the accumulated ash. To facilitate handling the cover plates, suitable retractable handles 16 are provided.

Transverse supporting beams or bars 17 are arranged in the bottom of the base portion 13 and function to mount a prefabricated housing 18 which may be constructed of any suitable material, such as properly sized pieces of sheet metal. This housing 18 is illustrated in the several figures as only partially filling the base portion 13 of the heating plant. It may be inserted and removed with respect to said base portion through a suitable opening 19 formed in one side wall of said base portion.

The top wall 20 of the housing 18 is provided with a suitable opening 21. The side wall 22 of the housing is provided with a suitable opening 23. These openings 21 and 23 will be described at a later point as accommodating certain portions of the stoker mechanism that is associated with the housing 18. The outer end of the housing 18 is closed by the removable wall 24.

Figs. 1 and 3 illustrate the stoker retort 25 as being arranged in the inner portion of the housing 18 with its fuel delivering branch 26 registering with the top wall opening 21 of the housing. The inlet or receiving branch 27 of the retort terminates adjacent the side wall 22 of the housing and registers with the opening 23. This inlet or receiving branch 27 is suitably connected with the sectional casing 28 of a fuel feeding conveyor that extends to a suitable source of supply of fuel. This source of supply may consist of a bin or a hopper of desired capacity and construction. It will be noted by inspecting Figs. 1 and 2 that the casing 28 extends through an appropriate opening 29 formed in a side wall of the heating plant base 13 so as to extend to the exteriorly located fuel bin or hopper 30.

The fuel feeding conveyor further includes a feed screw 31 which extends from the bottom portion of the bin or hopper 30 through the conveyor casing 28 and into the inlet or receiving branch 27 of the retort 25. The feed screw 31 includes the shaft 32 that extends through the tubular extension 33 of the retort 25 so that the projecting extremity of this shaft may be suitably connected to means for driving the feed screw. The end portion of the feed screw shaft 32 that is arranged within the tubular extension 33 of the retort is provided with a reversely pitched flight 34 which functions to prevent fines from working out of the retort through the bore of the extension.

The outlet or discharge branch 26 of the retort 25 registers and communicates with the tuyère portion 35 of the rotatable burner head that further includes the ring-shaped body 36. The tuyère 35 and body ring 36 are illustrated in Figs. 1 and 3 as being shaped to provide between the same an annular space 37 which functions to deliver combustion supporting air uniformly to the conventional openings provided by the tuyère 35. This annular air delivering space 37 communicates with the interior of the housing 18 through the flanged throat 38 of the body ring 36. It will be seen that the bore of this flanged throat is of suitable diameter to provide for this communication exteriorly of the aligned and communicating end portion of the tuyère 35 and the branch 26 of the retort.

The rotatable burner head, formed by the retort 35 and the body ring 36, are supported by the anti-friction bearings 39 and 40. The anti-friction bearing 39 is located between the interior end of the tuyère 35 and the outer end of the retort branch 26. The anti-friction bearing 40 is employed to support the rotatable burner head on the margin of the housing top wall opening 21. A suitable sealing flange 41 is associated with the bottom portion of the body ring 36 and functions to prevent loss, or short-circuiting, of combustion supporting air from the interior of the housing 18 to the combustion chamber 12.

The rotatable burner head body ring 36 has suitably fastened thereto a laterally projecting ash collector blade 42. By rotating with the burner head, this collector 42 will function to deliver to the ash receiving pit 14 the ash that spills over or is discharged from the periphery of the burner head onto the top of the housing. An ash break-off bracket 43 is suitably anchored to the top wall 20 of the housing 18. It will be seen, by inspecting Figs. 1 and 2, that this ash breaker is shaped to allow for the passage of the ash collector blade 42 while its upper end portion is operatively associated with the upper peripheral edge of the rotatable burner head.

Figs. 1 and 3 illustrate the flanged throat 38 of the burner head body ring 36 as being formed with an annular series of gear teeth 44 which are positioned within the housing 18. These gear teeth mesh with a toothed driving gear 45 that is keyed to the projecting extremity of the feed screw shaft 32. By means of a suitable axially separable coupling structure, not shown, the extremity of the feed screw shaft 32 is drivingly connected to the low speed shaft of the speed reducer unit 46. This unit is mounted on a base plate 47 that is removably associated with the bottom wall of the housing 18. That is to say, the speed reducer unit 46 may be inserted and withdrawn with reference to the housing 18 through the outer end of said housing by removing the end wall 24. The mounting base plate 47 is employed for slidably supporting the unit 46 within the housing. Guide strips 48 cooperate with the base plate 47 for this purpose.

A suitable prime mover, such as the electric motor 49, is mounted on the speed reducer unit 46 and functions to drive the train of gears, not shown, which form a part of this unit.

For the purpose of developing static air pressure within the housing 18, the armature shaft of the electric motor 49 has mounted thereon the fan 50. It will be seen by inspecting Fig. 1 that this fan is located just inwardly of the removable end wall 24 of the housing 18. This end wall, preferably, is provided with a suitable air inlet opening, not shown, which is controlled by the automatic shutter or damper mechanism 51. Suitable mechanisms of this type are available on the open market and, for that reason, it has not been disclosed in detail. It will be appreciated that the development of static air pressure within the housing 18 will cause the burner head to be supplied with air for supporting combustion of fuel that is delivered to said head.

By employing an electric motor 49 which will rotate the fan 50 at the proper speed to build up the desired static air pressure within the hous-

ing 18, and by employing a speed reducer unit 46 which will step down or reduce the speed of rotation of the armature shaft to the desired extent, the slow speed shaft of the speed reducer unit 46 will rotate at a suitable number of revolutions per minute to provide a direct drive for the fuel feeding screw 31. By employing the gear drive 44—45 between the low speed shaft of the speed reducer unit 46 and the body ring 36 of the burner head, this head can be rotated at a desired low speed.

The modification disclosed in Figs. 4 to 7 inclusive differs from the embodiment of the invention previously described by employing ash removal mechanism in place of the ash receiving pit 14. All other elements of the stoker assembly are the same. For that reason, the same reference numerals will be applied to identical elements and the ash removal mechanism will be all that is specifically described.

Figs. 5 and 6 illustrate the housing 18 as being provided with a lateral extension 52 which is employed for housing a gear 53 that meshes with the gear 45 mounted on the feed screw shaft 32. This gear 53 is suitably keyed to the shaft 54 of the ash removal screw 55. This ash removal screw extends horizontally through the base portion 13 of the heating plant in horizontal alignment with the fuel feeding screw 31 and passes through a suitable opening formed in the same side wall of the heating plant base portion as the fuel feeding screw. The portion of the ash removal screw 55 that passes through the interior of the heating plant base portion 13 is not enclosed. However, ash will accumulate in the base portion 13 and will eventually act as a trough within which the removal screw will operate.

Exteriorly of the heating plant base portion 13, the ash removal screw 55 is enclosed in a casing section 56 that is suitably secured at its inner flanged end 57 to the adjacent side wall of the base portion 13. The outer flanged end 58 of the casing section 56 is suitably secured to the elevator casing 59 in line with an opening 60. The ash removal screw shaft 54 is journaled at its outer end portion in a bearing 61 that is mounted in the opposite side wall of the elevator casing 59.

The portion of the ash removal screw shaft 54 that is located within the foot portion of the elevator casing 59 has suitably keyed thereon the foot sprocket wheel 62 over which is trained the elevator chain 63. A head shaft 64 is suitably journaled in bearings 65 carried by the upper portion of the elevator casing 59. A head sprocket wheel 66 is suitably mounted on the head shaft 64 and has the elevator chain 63 trained thereover. Suitable flights 67 are attached at equi-spaced intervals to the links of the conveyor chain 63.

The upper end portion of the elevator casing 59 is bifurcated to provide two laterally spaced branches 59*a* that are open at their outer or lower ends. These branches 59*a* are so arranged that ash receiving receptacles 68 can be positioned to receive the ash that is discharged from the ends of the elevator casings branches 59*a*.

It will be appreciated that when the fuel feeding screw shaft 32 is rotated by the electric motor 49 and its associated speed reducer unit 46, the ash removal screw 55 and its associated elevator 63—67 will be actuated to remove ash from the heating plant base portion 13 and deliver it to the receptacles 68.

It is to be understood that the forms of this invention herewith shown and described are to be taken as preferred examples of the same, and that various changes in the shape, size, and arrangements of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described the invention, I claim:

1. In fuel burning apparatus having a combustion chamber, a housing below said chamber having side openings and a top opening, a retort mounted within said housing and extending between one of said side openings and said top opening, a rotatably mounted burner head communicating with said retort at said top opening and projecting into said combustion chamber, a gear on the bottom of said burner head, a motor within said housing, a speed reduction mechanism driven by said motor and having an output shaft, a gear driven by said output shaft and meshed with said burner head gear, annular spaced bearings on opposite sides of said burner head gear for rotatably mounting the burner head on said retort and the top of said housing respectively, a fan within said housing driven from said motor for drawing combustion air into said housing through said other side opening for delivery to the burner head, and means sealing the joint between the rotating burner head and said housing for confining delivery of combustion air to said burner head.

2. In fuel burning apparatus having a combustion chamber, a housing below said chamber having a side opening and a top opening, a retort mounted within said housing and extending between said side opening and said top opening, a rotatable burner head communicating with said retort at said top opening and projecting into said combustion chamber, a motor within said housing, a gear rigid with a portion of said rotatable burner head depending within said housing, a driven gear meshed with said burner head gear, a screw conveyor tube connected to said one side opening of said housing for delivering fuel to said retort, reduction gearing within said housing drive connecting said motor with said driven gear and the screw conveyor within said tube, and annular bearings on said retort and housing respectively disposed at opposite sides of said burner head gear for rotatably supporting said burner head over said top opening.

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